



## Mine and Obstacle Breaching Technology

One mission of U.S. Naval forces is to clear, or "breach," lanes through mine fields and other obstacles so that Marine Corps amphibious forces can move safely and rapidly onto defended beaches. Current breaching capabilities are limited and extremely dangerous, requiring slow, deliberate, human-intensive operations. The Office of Naval Research has embarked on a program to develop a precision assault breaching capability that will eliminate the need for human-intensive operations in minefields and allow for more rapid clearing of safe lanes for Marine amphibious landings.



One such system currently under development uses thousands of spinning darts to neutralize, detonate, or otherwise render harmless explosive underwater mines that may be buried in soil or sediment. This system is also effective for disabling land mines that may be buried under a few feet of soil or sand.

The darts are dispensed from a cylindrical GPS-guided bomb that is dropped from a Naval or Air Force aircraft. The bomb, which has a helical pattern inscribed on its interior, ejects a spinning cylindrical canister 1000 feet above the target, in much the same way that a rifle barrel spins a bullet. The canister contains 6500 darts, which spin inside the canister. A small explosive charge breaks away the canister walls, releasing the spinning darts over a circular area 60 feet across.

The seven-inch darts have blunt tips, and when they enter the water or soil, they create an air pocket through which they travel, a phenomenon called "cavitation." This stabilizes the dart, reducing friction so that it can penetrate about two feet of sand or seven feet of water. The darts penetrate the surface of the buried mines without setting off the detonating triggers.

Depending on the surroundings and the type of mines to be disabled, the darts carry a payload of chemicals that decompose the explosives in the mines, gas-producing chemicals that increase the pressure inside the mines to blow them apart, or explosives that detonate the mines. The chemicals are designed to decompose in the environment, so darts that do not land on a mine do not leave harmful deposits behind.

The technology demonstration system is still under development, but with the proper approvals, a fieldable system could be ready by 2015.

### Specifications:

Number of darts	6500
Dart length	7 inches
Payload	chemical, reactive material, or high explosive
Area covered	60 feet diameter
Penetration	2 feet of soil or 7 feet of water, depending on conditions

